

Cognitive outcomes following metabolic and bariatric surgery in adults with obesity: a protocol for a systematic review

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Author Affiliation:Medical University of Białystok,
Białystok, Poland.**ADMINISTRATIVE INFORMATION****Support** - No external funding.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY2026100020**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 5 October 2026 and was last updated on 5 October 2026.**INTRODUCTION**

Review question / Objective What longitudinal changes in cognitive performance are observed in adults with obesity following metabolic and bariatric surgery, and how do these changes vary according to cognitive domain and duration of postoperative follow-up?

Rationale Obesity is associated with impairment across several cognitive domains and with metabolic, inflammatory, vascular, and neurobiological abnormalities that may adversely affect brain function. Metabolic and bariatric surgery (MBS) produces substantial and sustained weight loss together with marked metabolic changes; however, the magnitude, domain specificity, temporal course, and mechanisms of cognitive changes following MBS remain uncertain. Previous studies have reported improvement, stability, and occasional deterioration depending on the cognitive domain and follow-up period. Interpretation is further complicated by

heterogeneous neuropsychological batteries, small samples, different surgical procedures, variable follow-up durations, repeated cognitive testing, and multiple publications originating from the same longitudinal cohorts. The present review was undertaken to synthesize longitudinal cognitive outcomes following MBS. During revision, the synthesis was further refined to explicitly account for overlapping participant cohorts and to characterize domain-specific and temporal cognitive trajectories rather than treating individual publications as independent evidence of improvement.

Condition being studied Obesity and cognitive function following metabolic and bariatric surgery. Obesity is associated with increased cardiometabolic disease burden and with adverse structural, vascular, metabolic, inflammatory, and functional changes affecting the central nervous system.

The review evaluates longitudinal changes in cognitive performance among adults with obesity undergoing MBS.

METHODS

Search strategy The final review searched PubMed/MEDLINE, Web of Science Core Collection, Cochrane Library, and Scopus. The original conceptual search combined terms related to obesity, bariatric surgery, and cognition. Database-specific syntax was subsequently developed according to the indexing and search interfaces of the individual databases. No date restrictions were applied.

PubMed:

(obesity OR obese OR "morbid obesity") AND ("bariatric surgery" OR "gastric bypass" OR "sleeve gastrectomy" OR RYGB OR VSG) AND (cognition OR "cognitive function" OR neuropsychological OR memory OR "executive function" OR attention)

Web of Science Core Collection:

(obesity OR obese OR "morbid obesity") AND ("bariatric surgery" OR "gastric bypass" OR "sleeve gastrectomy" OR "weight loss surgery") AND (cognition OR "cognitive function" OR "cognitive performance" OR memory OR attention OR "executive function")

Cochrane Library:

(obesity OR obese OR "morbid obesity") AND ("bariatric surgery" OR "gastric bypass" OR "sleeve gastrectomy") AND (cognition OR "cognitive function" OR memory OR attention OR "executive function")

Scopus:

TITLE-ABS-KEY((obesity OR obese OR "morbid obesity") AND ("bariatric surgery" OR "gastric bypass" OR "sleeve gastrectomy" OR RYGB OR VSG) AND (cognition OR "cognitive function" OR neuropsychological OR memory OR "executive function" OR attention))

The original search was conducted on 11 April 2026. Because a technical problem prevented the original Scopus records from being exported into the screening dataset, the Scopus search was repeated on 27 September 2026. The repeat Scopus search yielded 815 records after predefined language and publication-type restrictions; after deduplication against the original screening dataset, 251 unique additional records were screened. No additional eligible publication was identified.

Participant or population Adults with obesity undergoing metabolic and bariatric surgery. The predefined target age range was 18–65 years. During revision, this criterion was clarified as defining the target adult bariatric population rather than an absolute participant-level cutoff. Studies were therefore not excluded solely because individual participants were older than 65 years

when the study population substantially overlapped with the target age range and otherwise fulfilled the eligibility criteria.

Intervention Metabolic and bariatric surgery performed for obesity, including Roux-en-Y gastric bypass (RYGB), sleeve gastrectomy/vertical sleeve gastrectomy (SG/LSG/VSG), and gastric banding where represented in eligible cohorts.

Comparator A comparator group was not mandatory.

Eligible studies included single-arm prospective pre–post cohorts as well as studies using nonsurgical, waiting-list, conservative-treatment, or alternative surgical comparators.

For comparative studies, the comparator was recorded and considered during interpretation.

Study designs to be included Prospective longitudinal studies assessing standardized cognitive outcomes before and after MBS, with or without a comparator group. Prospective controlled observational studies were eligible. Studies embedded within randomized perioperative trials were eligible when they provided the required pre-/post-MBS cognitive assessments; however, randomization unrelated to exposure to MBS was not interpreted as randomized evidence for the cognitive effect of surgery.

Eligibility criteria Inclusion criteria:

Adults with obesity, predominantly within the target age range of 18–65 years; MBS performed as the surgical intervention for obesity; standardized neuropsychological or cognitive assessment; cognitive assessment performed before surgery and at least once at ≥ 3 months after MBS; prospective longitudinal design; peer-reviewed original research; full-text availability; English language; no publication-date restriction.

Exclusion criteria:

Pediatric/adolescent-only populations without an eligible adult population; no MBS intervention; exclusively non-standardized/non-validated cognitive assessment; no preoperative cognitive assessment; no postoperative cognitive assessment at ≥ 3 months; cross-sectional or retrospective studies; case reports/series; reviews/meta-analyses; editorials/letters/conference abstracts; full text unavailable; non-English publication.

Studies reporting cognitive outcomes earlier than 3 months were eligible only when they also included at least one assessment at ≥ 3 months.

Multiple publications from the same underlying cohort were not treated as duplicates if they provided complementary cognitive outcomes, follow-up periods, predictors, moderators, or mechanistic analyses.

Information sources PubMed/MEDLINE, Web of Science Core Collection, Cochrane Library, and Scopus were used in the final review.

No systematic search of trial registries, grey literature, unpublished dissertations, forward-citation databases, or reference lists was performed.

Eligibility was restricted to peer-reviewed English-language full-text publications.

These restrictions are acknowledged as potential sources of selection and language bias.

Main outcome(s) The primary outcome was longitudinal change in standardized cognitive performance from the preoperative baseline to postoperative follow-up. Cognitive outcomes were synthesized within six domains: memory, executive function, attention, information processing speed, language, and visuospatial function.

Eligible postoperative follow-up was ≥ 3 months. Earlier postoperative measurements were retained as supplementary time points only within otherwise eligible longitudinal studies.

Effect measures were extracted as reported by the primary studies, including raw or standardized cognitive scores, mean changes, group-by-time effects, *p* values, standardized effect sizes, and other reported estimates.

No common pooled effect measure was calculated because a meta-analysis was not performed.

Additional outcome(s) Additional outcomes included global cognitive performance where reported and associations between cognitive change and postoperative weight loss, glycemic regulation/insulin sensitivity, inflammatory markers, mood and depressive symptoms, obstructive sleep apnea, physical activity and sedentary behavior, nutritional or metabolic factors, neuroimaging measures, metabolomic measures, and gut microbiota-related variables. These outcomes were used to contextualize potential predictors, moderators, mediators, and mechanisms and were not treated as independent primary evidence of cognitive improvement.

Data management Search records were imported into Rayyan for record management and duplicate detection. Study selection was performed in two stages: title/abstract screening followed by full-text eligibility assessment.

In the original review process, screening was initially conducted by one reviewer. During revision, a second reviewer independently repeated the screening against the same eligibility criteria to reduce selection bias. Disagreements were resolved by discussion and, when necessary, consultation with a third reviewer. The final manuscript therefore reports the independently repeated two-reviewer screening procedure.

Data were extracted into structured review tables including bibliographic information, study/project identity, study design, country, participant characteristics, surgical procedure, comparator status, follow-up duration, cognitive measures, cognitive domains, principal outcomes, effect estimates where available, and potential predictors/moderators/mechanistic variables.

During revision, publications from overlapping participant samples were linked at the underlying project/cohort level to avoid treating repeated reports as independent evidence.

Quality assessment / Risk of bias analysis

Methodological quality was assessed using a modified Newcastle–Ottawa Scale (NOS) adapted to the prospective longitudinal designs included in the review. Two reviewers independently assessed the included reports, with disagreements resolved by consensus.

The assessment comprised selection (0–4 points), comparability (0–2), and outcome (0–3), for a maximum of 9 points. Selection considered representativeness and characterization of the population, availability of preoperative cognitive assessment, and consideration of neurological or psychiatric conditions potentially influencing cognition. Comparability reflected adjustment for key demographic/anthropometric variables and additional clinically relevant factors. Outcome assessment considered standardized cognitive testing, adequacy of follow-up, and completeness of follow-up. Follow-up ≥ 6 months was considered adequate for assessment of sustained cognitive change. A follow-up-completeness point was awarded when loss to follow-up was $< 30\%$ or when greater attrition was accompanied by analyses indicating that participants lost to follow-up did not differ materially from retained participants on relevant baseline characteristics.

During revision, the previously used categorical thresholds (“high”, “moderate”, “low” quality) were removed because global NOS totals could obscure important domain-specific limitations. Total scores are now reported descriptively together with report-specific methodological concerns.

No formal GRADE certainty-of-evidence assessment was undertaken.

Methodological quality was assessed using a modified Newcastle–Ottawa Scale (NOS) adapted to the prospective longitudinal designs included in the review. Two reviewers independently assessed the included reports, with disagreements resolved by consensus.

Strategy of data synthesis The original working plan allowed for narrative synthesis when studies were heterogeneous and meta-analysis if sufficiently homogeneous data were available. Following data extraction, quantitative meta-analysis was considered inappropriate because of substantial clinical and methodological heterogeneity in surgical procedures, participant characteristics, neuropsychological instruments, cognitive-domain definitions, follow-up intervals, comparator groups, statistical methods, and outcome reporting.

A structured narrative synthesis was therefore performed. During revision, the unit of synthesis was explicitly redefined as the independent research project/cohort $\times$ cognitive domain $\times$ follow-up period rather than the individual publication. Multiple reports originating from the same participant cohort were considered jointly to avoid repeated weighting of the same participants.

For each cognitive domain, synthesis considered the direction of postoperative change, consistency and heterogeneity across independent cohorts, temporal trajectory, findings from comparator studies, reported effect estimates where available, null or unfavorable results, and methodological limitations. Discordant findings within the same project were retained and characterized as mixed, measure-dependent, or time-dependent.

An earlier manuscript version used simple vote counting and an author-developed Trend Improvement Score/graphical summaries. These approaches were removed during revision and are not part of the final synthesis.

Subgroup analysis No formal statistical subgroup analyses were planned or performed because no quantitative meta-analysis was undertaken. Differences according to cognitive domain, follow-up duration, and surgical procedure were examined descriptively when supported by the available evidence. These comparisons were considered exploratory narrative assessments rather than formal subgroup analyses.

Sensitivity analysis No formal quantitative sensitivity analysis was performed because the review did not include a meta-analysis. Studies were not excluded from the narrative synthesis on the basis of NOS score. Instead, methodological limitations, null findings, unfavorable findings, and conflicting results were retained and incorporated explicitly into interpretation.

Language restriction Yes - English only.

Country(ies) involved Poland.

Other relevant information This protocol is being registered retrospectively after completion of the systematic review but before publication. Retrospective registration cannot demonstrate that all final methodological decisions were prespecified.

A working methodological document was maintained during the review process. It documented the principal research question, peer-reviewed publication requirement, standardized cognitive assessment before and after bariatric surgery, English-language restriction, target age range of 18–65 years, a basic search framework, and an initial plan to use narrative synthesis when studies were heterogeneous and meta-analysis if sufficiently homogeneous data were available.

During completion and peer-review revision, several procedures were refined after study findings were available: database-specific search syntax was documented in greater detail; the Scopus search was repeated after a technical RIS-export problem; a second reviewer independently repeated screening; the 18–65-year criterion was clarified as a target population range rather than an absolute participant-level cutoff; overlapping publications were identified and consolidated at the underlying cohort/project level; the final evidence base was defined as 41 publications representing 23 independent projects/cohorts; publication-level vote counting was replaced by structured narrative synthesis at the cohort $\times$ cognitive-domain $\times$ follow-up level; an author-developed Trend Improvement Score and related graphical summaries were removed; the modified Newcastle–Ottawa Scale assessment was revised by removing high/moderate/low categories and adding report-specific methodological limitations; and practice effects, attrition, postoperative changes, potential mediators/confounders, and causal-language limitations were incorporated more explicitly.

No meta-analysis, formal publication-bias assessment, or GRADE certainty assessment was

performed because sufficiently comparable quantitative outcome bodies were not available.

Keywords metabolic and bariatric surgery; obesity; cognitive function; memory; executive function; neuropsychological assessment; cognitive outcomes.

Dissemination plans The completed systematic review will be submitted for publication in a peer-reviewed international journal. The registered protocol will provide a publicly accessible record of the review methodology and its retrospective methodological amendments. Supplementary materials will include study characteristics, methodological appraisal, cognitive-domain/test mapping, database-specific search strategies, and PRISMA documentation.

Contributions of each author

Author 1 - Ewa Płonowska - Conceptualization; methodology; investigation; study selection; data curation; formal analysis; evidence synthesis; visualization; writing – original draft; writing – review and editing.

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Author 4 - Barbara Mroczko - Supervision; interpretation of findings; writing – review and editing.

Author 5 - Hady Razak Hady - Supervision; adjudication of reviewer disagreements when required; interpretation of findings; writing – review and editing.